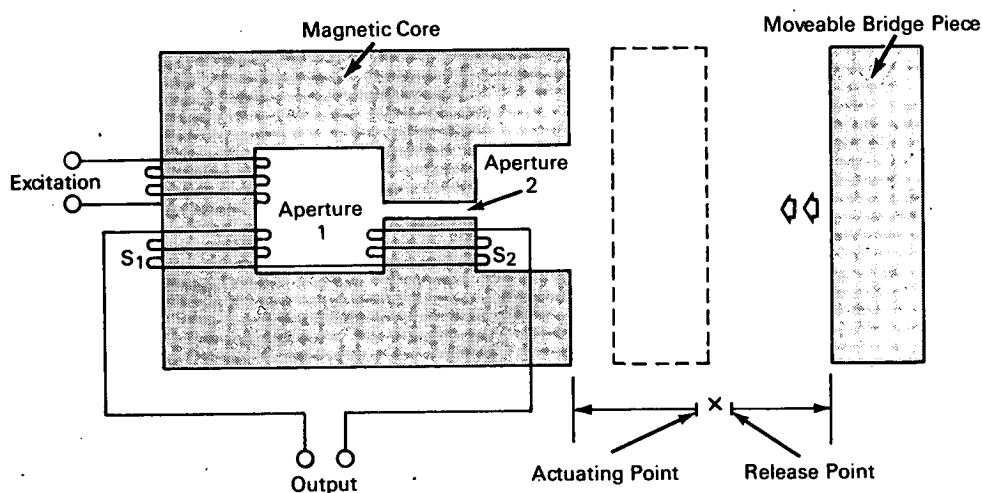


NASA TECH BRIEF



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Variable Reluctance Switch Avoids Contact Corrosion and Contact Bounce



The problem:

Metallic contact switches are subject to contact corrosion when used for protracted periods in a hostile environment such as outer space. Additionally, these switches experience "contact bounce" when switched from one state to the other. These vibrations, although measured in microseconds, could be falsely sensed by critical, high speed circuitry as changes in state.

The solution:

A variable reluctance switch consisting of a wire-wound magnetic core and moveable bridge piece that alters the core flux pattern to produce an electrical output useful for switching control media.

How it's done:

With the moveable bridge piece located at a distance X from the magnetic core, the reluctance between core and bridge prevents formation of a flux path about the

opening of aperture 2. Thus, the continuous excitation of the magnetic core primary winding creates a flux path around aperture 1 to induce equal voltages on secondary windings S_1 and S_2 . Since the secondaries are wound in opposite directions, the equal voltages are opposite in polarity and cancel so that no potential is produced at the output terminals. When the bridge piece is advanced to a point close to the core, the reluctance is sufficiently reduced to produce a flux path about the open end of aperture 2. This effectively reduces the voltage induced across S_2 by the primary excitation and a voltage imbalance occurs between S_1 and S_2 . This voltage imbalance results in a potential at the output terminals with a polarity determined by the selected winding of S_1 and S_2 . As this potential reaches a preselected level (as when the bridge piece passes through the actuating point), the element being controlled by the output terminals is activated. As the bridge piece is retracted, its passage of the release

(continued overleaf)

point collapses the flux path, cancelling voltage balance is restored between S_1 and S_2 , and the element being controlled by the output terminals is deactivated.

Notes:

1. This device lends itself to protective coatings that would render it corrosion proof while its operation remained unaffected.
2. Such a device could be used to operate bistable elements such as flip flop circuits or to drive relays or solenoids to control appreciable loads.
3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Manned Spacecraft Center
Houston, Texas 77058
Reference: B67-10137

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Paul C. Watson
of Massachusetts Institute of Technology
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